GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Artificial Intelligence in Energy and Automation, PG_00070260		
Field of study	SZTUCZNA INTELIGENCJA W ENERGETYCE I AUTOMATYCE		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2025/2026
Education level	second-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	3	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Electrical Power Engineering -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Alicja Lenarczyk	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	30.0	0.0	0.0	45

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	45	5.0	25.0	75

Subject objectives

The aim of the course is to develop competence in the use of artificial intelligence and data analysis methods to solve problems in energy and automation. The course enables students to improve their skills in acquiring, processing, and interpreting measurement data, designing and implementing predictive models, and assessing their usefulness in real technical systems. It also develops the ability to formulate research problems, integrate programming tools with engineering knowledge, and consciously relate AI solutions to ethical, industrial, and social aspects.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W101] is able to make an in-depth identification of key objects and phenomena related to the field of study, as well as theories that describe them and applicable analytical and design methods	Identification and analysis of phenomena – AI for forecasting, failure analysis, optimization	[SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym
[K7_U03] is able to obtain information from literature, databases and other sources, also in English, draw conclusions, formulate and fully justify opinions. substantiate opinions; is able to identify directions for further learning and implement the process of self-education	Data acquisition and processing (literature, databases, open energy data, etc.)	[SU2] Ocena umiejętności analizy informacji
[K7_U101] is able to formulate complex research problems and adopts appropriate methods, obtaining innovative solutions, cooperating with other people, both as a leader and a team member	Formulating research problems – AI applications, optimization, team project	[SU1] Ocena realizacji zadania [SU5] Ocena umiejętności zaprezentowania wyników realizacji zadania

Subject contents

Course content – lecture

1. Introduction to AI in the industrial and energy context
2. Overview of algorithms: regression, classification, decision trees, neural networks
3. Data sources (operational data, sensor data, public renewable energy and network databases)
4. AI challenges in energy: load forecasting, failure prediction
5. Ethics and interpretability of AI models
6. AI and decision automation industrial use cases
7. Overview of real-world implementations and start-ups in this field

Course content – laboratory

- Python: NumPy, Pandas, scikit-learn, matplotlib/seaborn
- Measurement data analysis cleaning, exploration
- Creating predictive models (regression, trees, neural networks)
- Simulation of power system operation with load prediction
- Team project: Intelligent data-driven decision making presentation + notebook

Prerequisites and co-requisites

Prerequisites
- Willingness to work with data and openness to using programming tools during classes.
- Basic computer skills and willingness to develop digital competencies.
- General understanding of technical issues related to energy or automation.

Additional requirements (optional, but helpful)
- Interest in the use of modern analytical tools and artificial intelligence in engineering practice.
- Willingness to independently explore introductory materials on Python programming provided at the beginning of the course.
- General knowledge of the basics of mathematics and statistics to support working with data.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
project assessment	60.0%	40.0%
lecture test	60.0%	60.0%

Recommended reading

Basic literature	1. Godsey, Brian. Think like a data scientist : tackle the data science process step-by-step, Shelter Island : Manning, 2017
Supplementary literature	1. Jordan Goldmeier, Becoming a data head : how to think, speak, and understand data science, statistics, and machine learning, Gliwice : Helion, 2023
eResources addresses	

Example issues/ example questions/ tasks being completed

1. Data preprocessing and exploratory data analysis of measurement data from power systems or automation: cleaning, feature engineering and visualization using Python (NumPy, Pandas, matplotlib/ seaborn).

2. Team project on data-driven intelligent decision in energy or automation, including model interpretability, ethical aspects of AI deployment and discussion of industrial implementation

Practical activites within the subject

Not applicable

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